PROFESSIONAL ENGINEER

Official Publication of American Association of Engineers

"The Voice of the Engineer"

This issue is devoted to the —

COMPENSATION

OF

PROFESSIONAL ENGINEERS

TRENDS FROM

1930 to 1958

Vol. 42 No. 4

The objects
of the American
Association of Engineers
shall be to promote the
social and economic welfare
of the Engineer, to stimu-
late public service in the
profession, to encourage
and develop the effi-
ciency of the Engi-
neer and to promote
unity in the
profession

Professional Engineer

"THE VOICE OF THE ENGINEER"

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Published Four Times a Year at Mount Morris, Illinois

The American Association of Engineers

8 South Michigan Avenue, Chicago 3, Ill.

me 42 December 31, 1957 Number 4

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Table of Contents

Compensation of Professional Engineer Trends from 1930 through 1957 3
Classification of Engineering Positions sub-professional 5
Table A—Years of Schooling for Engineers 5
Table B—Average Earnings Production Employees in 1956 7
Table C—Pay rates various Occupations in 1957 7
Table D—Salary Ratio for all Position Grades 10
Table E—Number of Engineers in Professional Fields 11
Table F—Annual Medial Salary in Professional Fields .. 11
Table G—Ratio of Salary in Professional Fields 12
Table H—Engineer Pay Increases from 1930 to 1955 13
Table I—Increase in compensation 1946 to 1957 15
Table J—Comparison of Annual Pay Increases and Comsumer Price Index 16
Salaries for Professional Engineers in 1957 17
Table K—Compensation by Age Groups 19
Table L—Salary Range 19
Charts on pages ..... 8, 15 and 20
Books for Engineers 22

M. E. McIVER, Editor

n Association of Engineers assumes no responsibility for statements made or opinions expressed by contributors of articles published in Professional Engineer.

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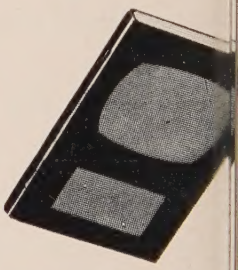

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CONTENT

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Legal Registration
A Model Law—Defini
Suggested Experienc
Qualification Guid
Addresses of Registr
Boards

QUESTIONS FROM EXAMINATIONS C

- Basic Fundament
- Chemistry, Science Materials
- Electricity
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Compensation of Professional Engineers—Trends from 1930 to 1958

By Arthur Richards, Chairman
Committee on Services and Salaries of Engineers
American Association of Engineers

A main purpose for preparing this survey—which is quite milar to other studies made during the past forty years by the Ameri- an Association of Engineers on the Classification and Compensation of rofessional Engineering Positions—is to assist Engineers and their mployers in arriving at just agreements regarding salaries of engineers: he classification and compensation plans can be used:

For determining the qualifications of the engineers to fill the respective positions, and the grading of the positions necessary to perform the work of the organization.

For providing an equitable salary schedule for all engineering positions in the organization.

he data of the Booklet can be used to:

Increase individual salaries where indicated.

Increase salaries of present employees in an organization.

Increase new salaries when changing positions or employers.

Determine equitable salaries for new organizations.

·ocedure for securing higher compensation in low pay organizations:

Reclassify employees to classification plan of Booklet.

Determine revised salary schedule for the various classes and grades of positions.

Submit your plan to the budget agency of your organization.

To those familiar with advocating increased compensation schedules is well known that the method of approach is of paramount importance. This survey supplies authentic data on salary rates in 1957 for gineers qualified to practice the profession of engineering in the respec- e positions as therein defined. The equity of the salaries, therefore, is finitely determined and it but remains to convince the budget agency their justness as applied to local conditions.

After a plan has been developed for a local engineering organization s best to acquaint some members of the council, commission, board or dget agency with the full details of the plan rather than attempt to esent the matter for the first time to the budget agency as a whole.

If such members appreciate the benefits to be derived from the use of impartial standardization plan on classification and compensation m which efficient engineering service will accrue to the employing ly, then they should be the persons to present the matter to the budget ncy for its consideration, approval and adoption.

To secure effective returns, both to the employee and the employ those desiring to benefit from the use of the plan must use it with und standing and good judgment in order that equity may be rendered to a

Due to changing national and world conditions compensation sche ules need to be modified from time to time as the economic situati warrants. At present we are in a perplexing inflation period, and the fore all professional engineers must remain alert to protect their perso interests. The American Association of Engineers hopes this BOOKLE on Incomes of Professional Engineers may assist you in your econom welfare.

Your Destiny

The technical age that confronts us with the benefits of mod engineering knowledge—as well as the possibility of nuclear extinctio is reaching out for the trained mind with offers of unprecedented opp tunity. This applies to all, both young and old, engaged in the work the engineering profession. Skilled brain power, you can be sure, is most precious national asset. So make the most of your talents and ab ties as you alone are the master of your destiny.

Salaries of Professional Engineers

The adoption and use of a sound classification and compensati plan for professional engineering service is of vital importance if th is to be an equitable standard of remuneration throughout the Uni States for services rendered by the members of the engineering p fession.

The position classification plan herein used for comparative p poses is reduced to its simplest form and can be interpreted readily those who are rather familiar with the professional and technical quirements, services and duties, of both large and small types of en neering organizations.

To determine the proper comparison of the compensation ra herein shown with that of a local organization it is essential that all local employees be reclassified on the basis of the following plan. A other method of comparison will not give a true analysis of the lo situation.

The experience ratings of the plan, therefore, are simply a guid determining the progress which could be made by an engineer from gr to grade if opportunity were available to secure the required profici technical experience.

Variation in individual ability characterizes engineering as it d other vocations. Years of service, or experience, do not necessarily im increase in ability at the rate set up in the plan. The Classification

Engineering Positions is based primarily on work to be performed in he respective grades.

The compensation schedule, therefore, when used for comparative or nalytical purposes should be used only to apply to persons whose abili- es enable them to perform the full duties of the respective grade posi- ions.

Classification of Engineering Positions

Sub-Professional

Many persons are engaged in sub-professional work who fully expect o continue their studies and experience with the firm idea of advancing o full professional status.

In 1957 the number of technical engineers in the United States was bout 600,000. This does not include the sub-professional engineering ds as: Those with little previous experience who assist with simple ngineering work; those who do the simpler form of professional work field, factory, laboratory or office with some arithmetical calculations; nd those under supervision who do or assist in engineering work not ecessarily requiring professional engineering education and training but quiring qualified sub-professional experience in the broad science of chnical engineering. In Table A it shows that about 22 percent of the dicated engineers had no formal college education and that about 60 rcent of them received bachelor's degrees.

Table A

Years of Schooling for Engineers

Data for 1957	Percent had years of schooling						
ofessional Field	Number	High School		College			Unknown
		1-3	4	1-3	4	5+	
echanical—Industrial	162,000	15.0	17.4	17.4	41.0	11.6	1.6
vil	142,000	12.4	14.8	19.4	39.6	12.6	1.2
ectrical	125,000	10.6	16.0	16.2	38.9	13.3	5.0
ning—Metallurgical	38,000	9.2	10.5	11.4	42.8	24.3	1.8
emical	37,000	4.3	4.8	6.8	54.0	28.0	2.1
ronautical	21,000	5.7	12.5	20.3	41.7	18.5	1.3
others	75,000	12.0	17.2	20.0	36.5	12.9	1.4
TOTAL	600,000	10.0	12.0	16.0	42.5	17.5	2.0

No specific data is given herein on the compensation for sub-pro- ssionals but their salaries usually are below or within the range of the nior group as given in these tables and charts and vary upon the size d importance of the employing organization and the individual class of b-professional work performed.

Professional Engineering

In order to simplify the classification and compensation of sala among the many position groups in the various professional fields engineering four groups have been selected, as, Chief Engineer, Se Engineer, Assistant Engineer, and Junior Engineer.

These four groups consist of many position grades with twenty more titles and eighty salary rates. The Federal government has o eighteen regular position grades with many titles among the vari engineering departments and services. The state highway departme large industries and utilities, populous cities and counties, usually h employees in all the position grades, titles and salary rates. Careful c sideration therefore must be given to the proper relationship of various positions which exist in each organization and the relative va of the duties, responsibilities and services.

Because of this great diversification it is not expedient in a sh treatise to give detailed data on all of the positions involved. Recou therefor is taken to dividing the entire professional engineering occu tion into the four groups as selected above, with each group contai an upper and lower position level. It is obvious, and a fact, that in engineering departments of the smaller organizations the number kind of positions and titles are quite limited and the pay correspondi lower.

Group D—Junior Engineer

Generally the education requirements are equivalent to graduat from an accredited technical college, or sufficient education and exp ence to perform the full duties of the position.

The duties under immediate supervision are to perform work in field or office requiring knowledge of engineering practices and meth make working drawings and designs; prepare estimates and specif tions; make simple computations of a technical character; and perf minor services of many kinds of a technical engineering nature.

The lower grade in this group consists of recent graduates havin limited work experience and the younger persons who are securing a tional educational training and practical experience.

The upper grade employees and the ones securing the hig salaries in the group are those having four or more years of quali experience with increased knowledge of the technical requirements their positions.

This group contains about sixty-one percent of all the emplo engineers and as shown on Chart A receive salaries from $3,000 to $8,0 The Federal rate extends from about $3,700 to $5,800.

A comparison between the pay of these younger engineers and ol seasoned production workers in various kinds of employment is gi in Tables B and C.

Table B

Average Earnings Production Employees in 1956

Industry	Per Hour	Hour Week	Annual Wage
ilding Construction	$2.80	36.4	$5,300
ntract Construction	2.74	37.1	5,286
n-Building Construction	2.49	40.8	5,283
ining	2.30	42.4	5,071
ghways	2.33	41.8	5,064
ansportation	1.96	43.1	4,393
holesale Trade	2.01	40.4	4,222
anufacturing	1.98	40.5	4,170
tail Trade	1.57	38.5	3,144

Table C

Pay Rates Various Occupations in 1957

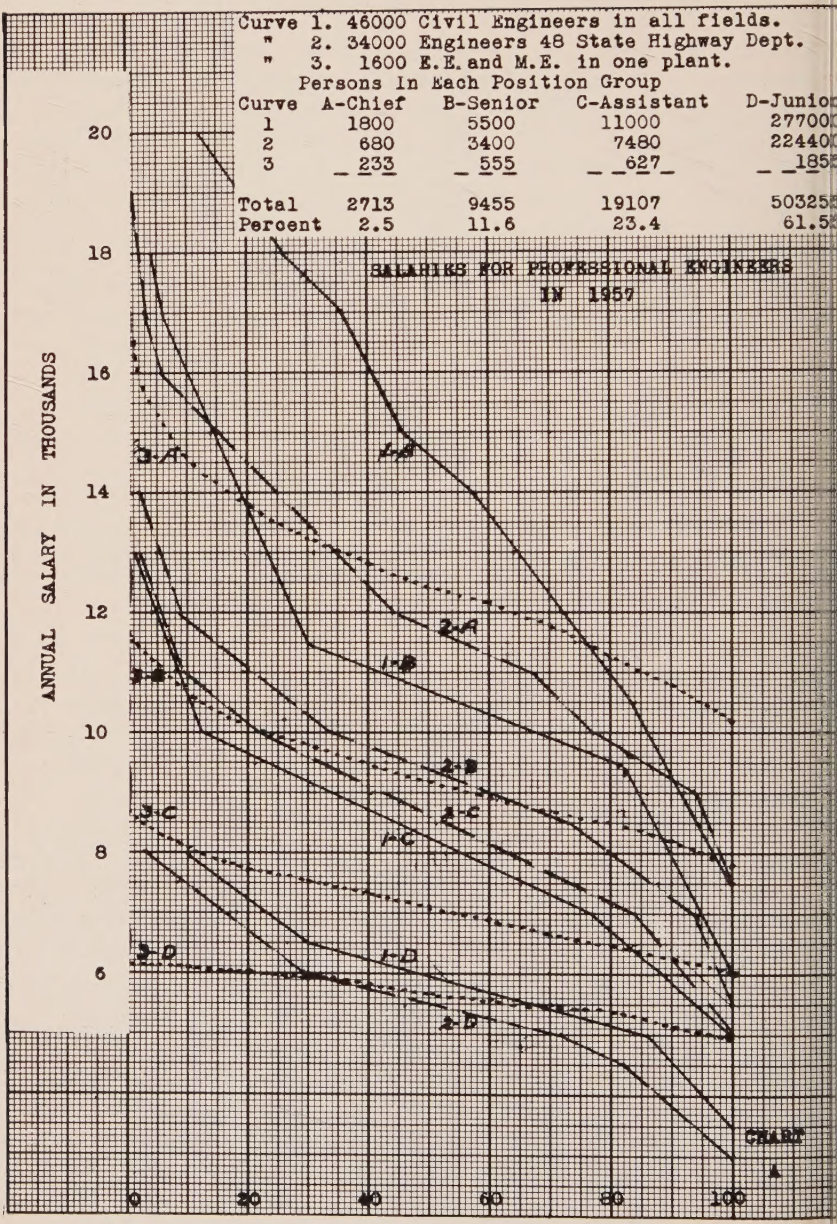
cklayers	$3.10 to $4.25 per hour.	Depending upon location of city.
ctricians	3.10 to 4.12 per hour.	Hours per week vary during year.
sterers	2.50 to 4.00 per hour.	Weeks per year vary.
mbers	3.05 to 3.85 per hour.	
penters	2.65 to 3.80 per hour.	
nters	2.25 to 3.50 per hour.	
lding Labor	1.30 to 3.00 per hour.	
ior Engineers	1.70 to 4.38 per hour.	Annual salary at 40 hour week.
ior Engineers	2.68 to 6.10 per hour.	Usually continuous employment.

oup C—Assistant Engineer

This group consists essentially of the persons who have advanced m Junior Engineer to higher responsibility and salary through pro- tion, passing a higher civil service test, or by changing to another ineering organization.

Under general supervision they have charge of the engineering work formed by the Group D Junior Engineers. The position requires the formance of difficult and diverse duties; the supervision of a bureau division of the organization; or the direction of studies, designs and struction requiring a high degree of professional training, substantial erience, good leadership and sound judgment. Usually a person in Group can qualify for State registration as a professional engineer.

This Group contains about twenty-four percent of the engineers and ART A indicates their salaries range from about 5,000 to 13,000. The eral rate extends from about 5,800 to 8,700.



Percent receiving salary indicated or more
Chart A—Salary Range

roup B—Senior Engineer

The engineers of this group usually have had twenty or more years service in professional work which includes, under general direction, fficult engineering duties on investigation, study, design, construction d operation of extensive engineering projects.

These engineers have advanced from the Group C ones of the same or nilar organization and have demonstrated their ability over others in eir group to successfully accomplish the difficult and unusual tasks signed to them.

The Group contains about twelve percent of the total engineers and nart A indicates their salaries range from about 6,000 to 16,000. The ederal rate extends from about 9,000 to 11,500. Because under the ederal government all positions for all services are under the jurisdic-on of only one agency, salary spread in the higher positions is not as eat as found where hundreds of organizations are considered.

roup A—Chief Engineer

This group consists of only the relatively few engineers who become e head of their organization; the chief deputy and others who have harge of a large or important division or department; and those who in eir engineering duties have shown the ability and capacity for master-g important responsibilities in management, administration and in chnologcal advancement.

Only about three percent of the engineers are employed in this group d Chart A shows that the salaries range from about 8,000 to 20,000. here are others, of course, who receive earnings much more than this, t they generally are in the executive or management divisions of their ganizations. The Federal rate extends from about 13,000 to 16,000 th a few earning a peak of 20,000.

Your Relative Grade of Position

The salary ratios between the four groups will vary according to the pe and size of organization and also to the region of employment.

After consideration of all the data herein shown it is quite obvious at with so many grades and titles in the various engineering organiza-ns throughout the country each engineer himself will have to deter-ne just about where he stands in the overall employment plan of gineering.

The information compiled in the charts and tables has been secured m many sources and may be considered as fairly representative of the nomic conditions within the profession.

Relative Earnings

The Census Bureau has reported on the 1956 earnings for th nation's 43,000,000 families as follows:

Families	Percent of Total	Annual Earnings
3,000,000	7	Under 1,000
7,000,000	16	1,000 to 2,000
16,000,000	37	2,000 to 5,000
12,600,000	30	5,000 to 10,000
3,500,000	8	10,000 to 15,000
900,000	2	Over 15,000

The Compensation in 1956 for 600,000 engineers was estimated a

Engineers	Percent of Total	Salary
150,000	25	Under 5,900
150,000	25	5,900 to 6,445
150,000	25	6,445 to 7,660
150,000	25	Over 7,660

That is, 75 percent of the engineers received over 5,900 per annum wh is more than the amount 70 percent of all of the families secured. other words, the "poor engineer" has maintained a relative high stand of earnings.

Where You Work and Live

Compensation and the cost of living depends to some extent upon t location of the region in the United States in which you live.

Table D
Salary Ratio for All Position Grades

	Compensation		Consumer Price Inde	
Year	1930	1957	1930	19
National	1.00	1.00	1.000	1.0
Middle Atlantic	1.10	1.04	.987	0.9
Far West	1.08	1.03	1.147	1.0
New England	1.03	0.97	0.920	1.0
North Central	1.02	1.01	0.954	1.0
South East	0.94	0.99	0.903	1.0
Middle West	0.93	0.94	1.023	1.0

As shown, the highest compensation index for both 1930 and 1957 is the Middle Atlantic region while the lowest cost of living was in t South East in 1930 and the Middle Atlantic in 1957.

Because of the present changing conditions due to Federal wa potential contracts and highway aid the indices above may vary quite bit in coming years due to regional circumstances.

Table E Number of Engineers in Professional Fields

	Percent at Age			
	Under 25	25 to 45	Over 45	Engineers in 1957
echanical	5.5	62.3	32.2	162,000
vil	6.9	52.8	40.3	142,000
ectrical	7.5	62.2	30.3	125,000
ining	8.2	64.0	27.8	38,000
emical	7.0	77.0	16.0	37,000
ronautical	6.6	83.0	10.4	21,000
l Others	10.6	57.0	32.4	75,000
erage	7.5	65.5	27.0	600,000

Table E gives an estimate of the number of persons engaged in the ferent fields of professional engineering. The basic data is taken from e 1950 census whose definition of an engineer is less exacting than that the professional engineering societies.

Many persons during census taking time who are engaged in work an engineering nature list themselves as professional engineers when fact they are in the sub-professional or technical aid group. By the xt census, however, many of them through additional study and quali-d experience will have advanced to professional status and this is arly shown in Table A which indicates that 38 percent of the present nsus engineers did not have the full benefit of college educational ining.

Annual Median Salary in Professional Fields

Table F gives the salary range for the years 1930 and 1946 in the e main fields of the engineering profession. The salaries are given r the 1st quartile, that is 25 percent of the engineers received the salary icated or less; for the median, that is 50 percent received more or eived less than the salary indicated; and for the 3rd quartile, that is percent received the amount shown or more.

Also shown are the salaries received in 1930 and 1946 by engineers h college degrees at the ages of 32 and 54. An examination of Chart which gives data for 1957 indicates the salaries have increased con-erably since those years. Under the Index columns is given the ease in pay for 1946 over 1930. The median range gives a maximum 161 for electrical engineers and a minimum of 112 for the chemicals.

Table F

	Year	1st Quar-tile	Index	Med-ian	Index	3rd Quar-tile	Index	Age 32	Age 54
anical	1930	2,700	100	3,732	100	5,460	100	3,972	5,916
	1946	3,864	144	4,908	132	6,324	116	4,836	6,518
	1930	2,556	100	3,324	100	4,464	100	3,578	4,968
	1946	3,648	143	4,416	133	5,616	126	4,176	5,436
rical	1930	2,412	100	3,300	100	4,860	100	3,948	5,496
	1946	3,732	155	4,716	171	6,036	124	4,380	6,240
g-Metal.	1930	2,892	100	4,000	100	6,035	100	4,308	5,544
	1946	3,756	130	5,000	125	6,720	112	4,620	7,296
ical	1930	2,652	100	3,912	100	5,880	100	4,596	6,000
	1946	3,528	133	4,356	112	5,652	96	4,716	7,680

Ratio of Salary in Professional Fields

Table G is derived from the data of Table F and shows the ra between the median salaries in the five fields for the ages of 32 and It will be noted in the four main columns the maximum salary was p to the chemical engineers three times, while the minimum was paid the civil engineers in all the columns. There are about four times many civils as chemicals and this may have quite an influence on salary rates. The number of engineering students and graduates 1956 was:

Field	Students	Graduates
Electrical	51,650	1,700
Mechanical	47,412	2,100
Civil	26,486	2,130
Chemical	16,992	230
Mining, etc.	8,460	540
Total	151,000	6,700

Which field to choose for a lifetime occupation depends upon m than the monetary returns as the five fields offer various kinds of emp ment conditions under many different circumstances. Which to depends upon various tangible and intangible things each person siders important to his future plan of living.

The graduate or beginner is looking beyond the starting salar he wants the so-called fringe benefits for the future such as, job secu advancement prospects, hours of work, vacations, hospitalization sick leave, location environment for his family, work insurance an tirement, and inclusion under the provisions of social security.

Table G

Age 32 in 1930			Age 32 in 1946			Age 54 in 1930			Age 54 in 1946	
Field	Salary	Index	Field	Salary	Index	Field	Salary	Index	Field	Salary
Chemical	4,596	100	Mechanical	4,636	100	Chemical	6,000	100	Chemical	7,680
Mining	4,308	93.6	Chemical	4,716	97.5	Mechanical	5,916	98.6	Mining	7,296
Mechanical	3,972	86.3	Mining	4,620	95.5	Mining	5,544	92.4	Mechanical	6,518
Electrical	3,948	86.0	Electrical	4,380	90.6	Electrical	5,496	91.6	Electrical	6,240
Civil	3,578	78.0	Civil	4,176	86.4	Civil	4,968	82.8	Civil	5,436

Changing Salary Rates

An approximate measure of variance in the compensation of e neers is given in Table H for various years from 1930 to 1957. The t is based upon the pay for the first quartile, median, and third qua and definitely shows the effect of the 1930 depression, at the war pe in the 40's, and the present inflation.

In the 1st Quartile, which includes most of the junior or you

ngineers, it is shown the salary index for 1957 is 228 compared to 100 1930, and this is a greater relative increase than shown for the older ngineers in the median and 3rd Quartile groups.

During this period of time the median salary increase for age 32 lvanced to index 184, while for age 54 it increased only to index 166. his again agrees with the data of other tables herein included, that the lative increase in pay for the younger engineers is greater than that for e older ones. This is a wise provision as it enables the younger engi- ers to become adjusted sooner so they may proceed more rapidly in coming highly qualified members of the profession.

Table H

Engineer Pay Increases from 1930 to 1955

ar	1st Quartile	Index	Median	Index	3rd Quartile	Index	Median Index Age 32	Age 54
30	2,580	100	3,468	100	4,980	100	100	100
32	2,014	78	2,820	81	4,010	80	79	81
34	1,776	69	2,520	73	3,650	73	70	73
39	2,352	91	3,325	96	4,930	99	82	104
43	3,132	129	4,130	119	5,700	114	115	117
46	3,780	147	4,800	130	6,360	128	130	131
53	5,016	195	6,216	179	7,500	151	178	163
57	5,890	228	6,445	186	7,660	154	184	166

Starting Salary of Graduate Engineers

Table I indicates the starting salary of college graduates from 1946 1957 in various occupations. In "all fields" of work the index increase pay is less than for engineering which indicates the engineers have en able to maintain a high beginner's standard of living comparable that of any of the other professions.

Starting salaries vary considerably throughout the country for many sons such as location, type of organization, extent of education and ential ability.

In the table showing the starting salaries of 111 graduates in 1957 a five year course given by one college there are several reasons given y the lowest paid graduate of the 49 mechanical engineers received 00 while the highest received 7,300. From the many articles written on subject of recruiting graduating engineers it appears that scholastic nding and potential possibilities primarily determine the amount bid an applicant.

Table I

Increase in Compensation 1946 to 1957
Average Starting Salary for College Graduates

Year	All Fields of Occupation		In Engineering		Engineers in Industrial Compan Starting		Final—Ma	
1946	2750	100	2900	100	2760	100	7680	1
1947	2800	102	2930	101	2900	105	7800	1
1948	2820	103	3000	103	3040	110	7950	1
1949	2940	107	3130	108	3180	115	8100	1
1950	2940	107	3180	110	3660	133	8700	1
1951	3012	110	3240	112	3900	141	9000	1
1952	3396	124	3660	126	4140	150	9360	1
1953	3648	129	3900	134	4380	159	10200	1
1954	3876	141	4140	142	4380	159	10660	1
1955	4092	149	4330	150	4500	164	10660	1
1956	4392	160	4730	163	5100	185	11160	1
1957	....		....		5560	201	12720	1

1957 Graduates of a Five Year Course in Engineering

Field	Chemical	Metallur.	Eng.-Physics	Electrical	Mechanical	C
Number	20	4	3	23	49	
Range of Salary	5700 6840	5500 6400	5400 6600	5300 6600	4700 7300	4 6

PAY DIFFERENTIAL

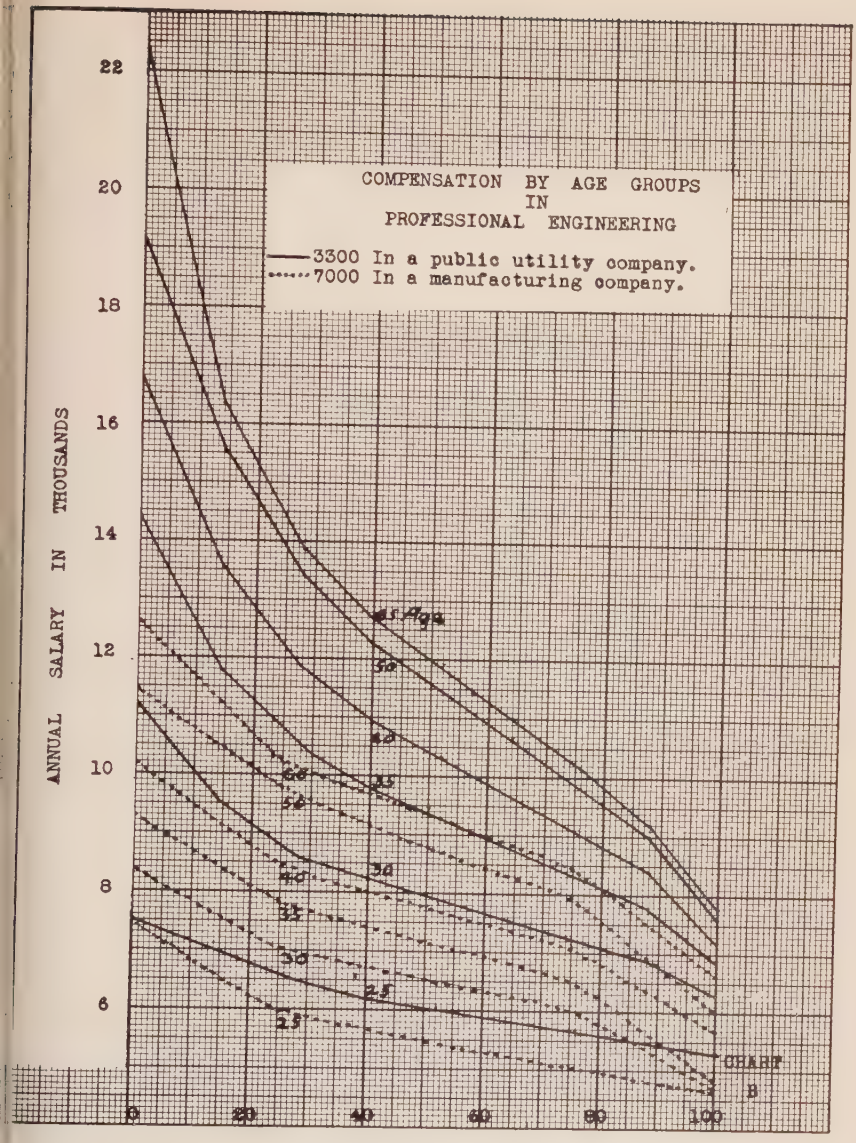
Much has been made of the assertion from many members of t profession that the differential in pay between what he gets and wh others get, either production workers or union trade employees, is t narrow and not justifiable by the value of services rendered.

This again brings forth the fact that the upgrading of pay for lab also increases the pay for others and therefore is of advantage to all in t general scheme of living.

Table J gives a comparison of pay increases between 1946 and 19 for production workers and engineers and relates them to the cost living. Due regard must be given to the amount of wages paid in 19 and 1956 for whereas the pay for manufacturing workers in 1946 w $2,278 with an index of 100 and grew to $4,190 in 1956 with an index 183, the pay of the engineer in 1930 was $3,780-$6,360 and increased $5,890-$7,660 even though the index increase was only 121 to 157. T actual salaries received by the engineers were considerably more than t ones received by the other workers so therefore quite a differential do exist.

As a matter of fact the difference in salaries between the lowest a highest paid in one group of engineering employees is clearly indicat on Charts A and B.

Table J shows that in 1956 the pay of production workers was $4,1 compared to a median of $6,445 for engineers, a difference of $2,2



Percent receiving salary indicated or more.

owever, Chart A, Curve 2-B which applies to 3,400 senior engineers state highway departments, shows the lowest salary was $5,500 and e highest $14,000, a difference of $8,500.

On Chart B it is shown that the difference in pay for 40 year old gineers in one organization is $9,600, while in another where the engi-ers are members of a labor union, the difference is $4,500.

The differential in pay between engineers themselves in like posi tions is obviously much greater than between engineering and othe occupations and is worthy of a special study if only to determine wha the minimum pay should be.

Clearly the implication is that engineers get paid for what they know and do and that many are not so well qualified as others. Such is true i all walks of life, but the engineer, possibly more than others, has th opportunity to develop skilled brainpower if he only will. As indicate in Charts A and B it surely pays off.

Another example to show the variation in salaries depending upo location, type and size of organization, kind of employees and peopl served, is herewith given.

This engineering organization serves a county in the New Yor metropolitan area containing forty-six municipalities as cities, village and townships with a total population of 750,000, a 1957 budget o $38,000,000 and a staff of engineers covered by thirty position titl Some of the positions and salaries are as follows:

Junior Engineering Aid	$ 3,000-$ 3,700
Draftsman	3,300- 4,600
Senior Engineering Aid	3,900- 5,000
Junior Engineer, Civil, Sanitary, Other	4,300- 5,400
Assistant Engineer	5,400- 7,000
Associate Engineer	6,000- 7,800
Senior Engineer, Designer, Plant Supt.	6,700- 8,600
Division Engineer	7,600- 9,800
Deputy Chief Engineer	9,800- 14,000
Chief Engineer	16,000- 21,000

Each position or salary group is divided into five rates with the i crements varying from $290 for junior engineer to $570 for senior eng neer and $900 for the deputy engineers.

Table J

Comparison of Annual Pay Increases and Consumer Price Index

Year	Production Workers			Graduate Engineers Av. Starting	All Engineers			Pric Ind
	Manufac- turing	Coal Mining	Laundries		1st Quartile	Median	3rd Quar- tile	
1946	2278	3020	2200	2900	3780	4800	6360	
Index	100	100	100	100	100	100	100	10
1947	114	115	108	2930–101				11
1948	124	124	113	3000–103				12
1949	125	109	116	3130–108				12
1950	135	121	118	3180–110				12
1951	148	134	125	3240–112				13
1952	155	135	128	3660–126				13
1953	164	147	132	3900–134	133	130	118	13
1954	164	139	133	4140–142				13
1955	175	166	121	4330–150				13
1956	4190	5496	3080	4730	5890	6445	7660	13
Index	183	182	140	163	157	135	121	13

SALARIES FOR PROFESSIONAL ENGINEERS IN 1957

Chart A indicates the range in salaries paid in 1957 to engineers in the four groups of positions classified.

The chart is read as follows: Curve 2-A shows that 75 percent of the 680 engineers in the Chief Engineer group of the State Highway Departments received an annual salary of $10,200 or more, that 50 percent received $11,700 or more, and that 25 percent received $14,000 or more.

Each engineer knowing his own position group and salary can readily determine his standing in relation to the chart. If he is an Assistant Engineer and has a salary of $8,000 then the chart shows that 55 percent of the Curve 1-C engineers in that group received more than he does, that 63 percent of the Curve 2-C engineers received more, and that 11 percent of the Curve 3-C did also.

The Chart presents a very disturbing aspect regarding engineers, being members of a labor union and thus subject to the regimentation of its rules and regulations. The engineers of Curve 3 are represented by a union which is accredited by the National Labor Relations Board as the sole bargaining agent for the engineers of this first class organization. The number 3 curves, it will be noted, are quite flat compared to the number 1 and 2 curves and indicate that salary increases are predicated on group action instead of personal ability and worth.

If the engineering profession is forced into unionism and socialism with its corresponding adverse effects on the incentiveness of its members to excell in engineering skill and accomplishment, then a great disservice will be done to the people of the nation. It is said that about 50,000 or 10 percent of the engineers in the country belong to labor unions of some kind or other. Little information is known as to what number are registered professional engineers, members of national engineering societies, fully accredited engineers, or those in sub-professsional classifications. In the public utility company shown on Chart B there are 3,000 sub-professional engineering employees in addition to the 4,300 fully accredited engineers.

The Charts clearly show that engineers who do not belong to unions have greater financial rewards than those who do. By the entire profession becoming unionized it may be the salaries then would be reduced to a lower uniform level.

A main objective of the national engineering societies and their several hundred thousand members is the advancement of the science and profession of engineering for the good of civilization, and the engineers. It would appear in the light of the recent revelations of labor union affairs that another primary objective of the engineering societies should be to protect and preserve the economic welfare of the engineer so he may continue to advance the first objective.

Engineers Joint Council composed of a dozen national societies in the field of engineering has been active since 1945 in the professional and sociological development of the individual engineer. It possibly, should plan to become the "bargaining agency" for all engineering employment conditions. In that way the engineers could combat the pernicious effects of unionism on the professional way of living and serving. No union or group should be vested with the right or power to say to any engineer or American you shall not work at your profession unless you join our union organization.

COMPENSATION BY AGE GROUPS

Chart B applies to electrical or mechanical engineers, physicists and chemists employed by two different high grade organizations. The 3300 engineers in the public utility group are highly qualified and rather specialized and do not belong to a labor union, while the 7000 in various plants of one manufacturing concern are members of a union with national affiliations.

This Chart, as in Chart A, shows the effect of unionism restricting the increase in compensation of engineers and definitely shows that the union group action on pay is of value to those of limited talent and ability and of detriment to those with higher qualifications.

While age 40 may have quite an influence on the employment of persons in many occupations it seems to have little effect on the earning capacity of engineers. In industry the retirement age usually is 65 and the chart shows that up to that time the engineers had continually increased their earning capacity, especially the ones not subjected to the restrictions and union bargaining.

The spread in pay for the age groups indicates that age or years of service in a company is not a primary factor in the determination of the pay rates. In the utility the pay range at age 40 extends from $7,200 to $17,800, while in the manufacturing company it extends from $5,700 to $10,200.

As the Chart plainly shows the longer an engineer lives the higher the pay. Then why not let the engineering societies continue to plan for the future as they have done so well in the past. High pay is not primarily for the purpose of giving an engineer more money. Essentially it is to provide for ease of mind and living so that more and better service can be rendered by the highly qualified workers.

Table K plainly indicates that age alone will not advance engineers from the minimum salary at any age to the maximum rate at that age. All of these electrical and mechanical engineers work in the same organization and their years of service vary from five to forty-five. The salaries given are for persons at the age given, as, thirty years old.

As will be noted the percentage of the 614 persons drops rapidly from age 30 to 65, and as shown in the last column the ratio between the

igh and low pay for each age groups is fairly consistent, with the excep-ion of age 60 to 65.

This reduction in pay after 60 agrees with a previous study in 1930 f 54,000 position where the rate of pay began to drop at age 60 and by 5 was about thirty percent below its peak. In other words the pattern of ompensation for engineers is about the same now as it was thirty years go.

Table K

	Salary at Age in 1957 for 614 Engineers							
ge	Number	Percent	Minimum	1st Quar-tile	Median	3rd Quar-tile	Max-imum	Ratio Max.-Min.
0	328	54	4620	6300	6480	7020	8400	182
0	135	22	5700	7200	7740	8400	10560	185
0	74	12	5760	8040	8760	9720	11400	198
0	57	9	6360	8400	9360	10200	12600	200
5	20	3	7440	8280	9112	9840	10800	145

The Engineer's Potential

As herein indicated the engineer is quite a variegated person. His tellectual development is subject to many hazards, the greatest one ossibly being his own vacillation. Too many reach their peak of intel-ctual growth in high school or college and then shortly after, due to any causes of their own making, they cease growing in engineering nowledge and accomplishment.

Chart C which portrays the possible psychological progress of the embers of the profession again demonstrates that skilled brain power a most precious asset and that the engineer alone through his talents d potential ability can guide his engineering destiny.

SALARY RANGE

The salary ranges as shown in the tables and charts could be used a guide for ninety percent of the engineers employed in most ganizations.

Table L

Group	Salary Range	Group	Salary Range
A-Chief	8,000 to 20,000	C-Assistant	6,000 to 12,000
B-Senior	7,000 to 16,000	D-Junior	5,000 to 8,000

Compare the salaries of your organization with the values shown ein in order to determine your relative standing. In some localities worth of the engineer as an economic factor is rather fully appreci-d and his compensation is usually above the averages indicated in this ort. In many places, however, he is considered purely as an accessory the performance of routine work.

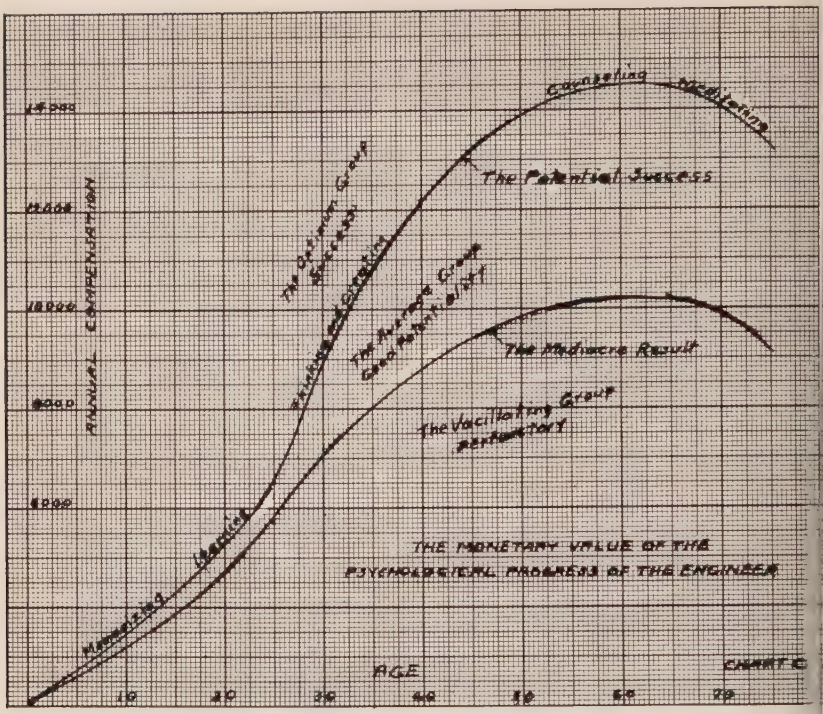


Chart C

The above chart which portrays the possible psychological progr of the members of the engineering profession again demonstrates t skilled brain power is a most precious asset and that the engineer alo through his talents and potential ability can guide his engineering desti

It lies entirely within the province of the members of the profess to demonstrate that a high economic value of the Engineer does exist a that it should be recognized in any and all engineering organizati throughout the entire United States.

In the past many engineers have been too reluctant to approach t problem of compensation as one requiring solution purely as a matt of professional self defense. A large number of others, however, ha appreciated that the mediocre economic status of the engineer has be due in great measure to the lack of progressiveness in the profession providing sound business arrangements for the employment of engine ing talent.

We have been psychoanalyzed, as being: strongly oriented to o profession; precise, tense, energetic but with little vision beyond the i mediate problems; have little interest in intangible questions and subl complexities; and do not have much vision on affairs not related to en neering matters.

It is just possible then we may need a "union" composed of the dministrative minds of the Engineers Joint Council to help formulate ational policies to promote and protect the social and economic welfare f the members of the engineering profession, and also to enhance the orth of engineering endeavor for the good of everyone.

Mention has been made many times that the engineers need a "na- onal society like the American Medical Association and the American ar Association" to speak for the entire profession. From many members f these professions it is evident their national associations do not include or speak for all the doctors nor attorneys on all or many things.

The history of the rise of engineers does not indicate the necessity f a national society to which all engineers should belong and which ould speak for the entire profession on all matters relating to the ngineer and his work.

At present in addition to scores of engineering societies with national embership there are hundreds of state, county and city societies spread roughout the whole country. There are too many factors involved to ve one "dictator" organization speak for the entire profession on all ings.

CONCLUSION

To those who have given considerable time to the study and develop- nt of classification and compensation plans for professional engineer- g service it is quite obvious that drafting an entirely equitable plan tisfactory to all engineers and their employers is a most difficult dertaking.

Perfection of such a plan has not been the objective of those who ve spent many years in making analytical studies of the large amount data submitted by many thousands of engineers employed in all parts the country.

The aim of endeavor has been to formulate equitable standards plicable to the great majority of engineers and the efforts of the past ty years have been of very material benefit to the members of the gineering profession. That a benefit also has accrued to the public at ge is quite evident to those who have watched the development of the rk of all national engineering societies in their endeavors to promote social and economic status of the engineer.

One of the greatest incentives towards creative and efficient profes- nal effort is to feel assured, without the burden of worry, of adequate ome to provide for material needs. If the wide adoption of these plans the Classifications and Compensation of Professional Engineering sitions, formulated by the American Association of Engineers, will be pful to the engineer in improving his station in life, then the Associa- n will feel amply repaid for any assistance it may have rendered to profession.

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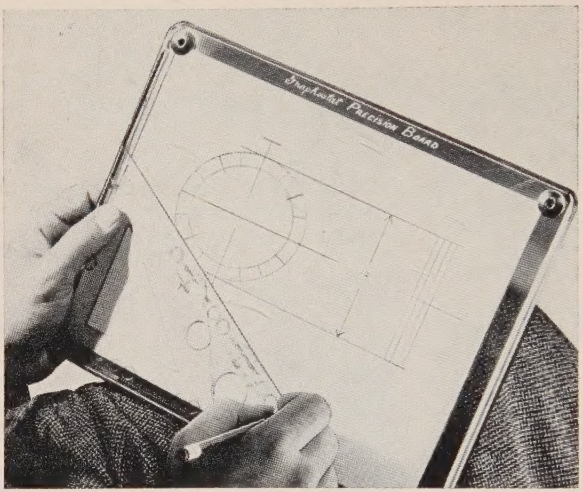

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